

# Analysis of Soot Produced on Combustion of Biomass

Jacqueline M. Wilson

Combustion particles in the atmosphere currently come from a variety of sources including those produced by the burning of biomass. This may be due to natural sources such as forest fires or, alternatively, due to human activity to produce energy. Carbonaceous particles produced by the combustion of biomass have a different composition to those produced by fossil fuel combustion; in particular a greater variety of polyaromatic hydrocarbons (PAHs) and their oxygenated compounds are found.

Many methods of soot analysis require bulk analysis but this does not allow any investigation into the size and composition of individual particles. A relatively modern technique – single-particle on-line aerosol mass spectrometry – is now available, which allows analysis of individual particles. In this investigation the instrument used is a single-particle laser desorption/ionization (LDI) time-of-flight (TOF) mass spectrometer (ATOFMS; TSI Inc.). Using this instrument combustion products can be fed directly to the inlet with no need to collect particles and re-suspend them first. This allows direct analysis, with no sample preparation, of the products when a biomass intermediate is burnt. Experiments have involved the combustion of eugenol, believed to be an important intermediate in the combustion of wood, and n-decane – a conventional hydrocarbon. This is the first time any measurements of this kind, direct analysis of single particles formed through combustion of a biomass intermediate, have been made.

Cluster analysis is carried out using Enchilada, a programme in development supplied by Carleton College, Minnesota that allows K-means clustering to be applied to data rather than the more commonly used ART-2a algorithm.

## Key References:

- 1) EM Fitzpatrick *et al.* Emission of oxygenated species from the combustion of pine wood and its relation to soot formation. *Trans IChemE, Part B, Process Safety and Environmental Protection* 2007; **85**: 430-40.
- 2) Hinz K-P, Spengler B. Instrumentation, data evaluation and quantification in on-line aerosol mass spectrometry. *J. Mass Spectrom* 2007; **42**: 843-860.